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PACIFIC  **TELESIS**
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September 14, 1994

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SEP 14 1994

William F. Caton
Acting Secretary
Federal Communications Commission
Mail Stop 1170
1919 M Street, N.W., Room 222
Washington, D.C. 20554

Dear Mr. Caton:

Re: *GEN. Docket No. 90-314 - Amendment of the Commission's Rules to Establish
New Personal Communications Services*

On behalf of Pacific Bell Mobile Services, please find enclosed an original and six copies of its "Reply Comments In Opposition To Comments By BellSouth" in the above proceeding.

Please stamp and return the provided copy to confirm your receipt. Please contact me should you have any questions or require additional information concerning this matter.

Sincerely,



Enclosures

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Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

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SEP 14 1994
FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON, D.C. 20554

In the Matter of)

Amendment of the Commission's Rules to)
Establish New Personal Communications)
Services)
_____)

GEN Docket No. 90-314

To: The Commission

REPLY COMMENTS BY PACIFIC BELL MOBILE SERVICES
IN OPPOSITION TO COMMENTS BY BELL SOUTH

I. INTRODUCTION

Pacific Bell Mobile Services files these reply comments in opposition to BellSouth's comments on further reconsideration filed in the above-captioned proceeding. The Commission should reject the bulk of BellSouth's comments concerning cellular companies' eligibility to participate in the auction for broadband PCS as an out-of-time petition for reconsideration. The Commission should reject BellSouth's arguments in any event because they are seriously flawed and do not provide a reasonable basis for any changes in the Commission's determinations on cellular eligibility. BellSouth relies primarily on the affidavit of Dr. Richard P. Rozek for its arguments. In his affidavit attached hereto, Dr. Paul R. Milgrom refutes the main points of Dr. Rozek's affidavit, revealing serious flaws in his analysis and showing that the Commission's restrictions on cellular eligibility are in the public interest. The restrictions are needed in order to promote effective competition in wireless markets and bring the benefits of lower prices and better services to consumers.

II. BELLSOUTH'S COMMENTS ARE ACTUALLY AN OUT-OF-TIME PETITION FOR RECONSIDERATION

BellSouth states that its comments are in response to the petitions for reconsideration filed by CTIA, BCIA, and Comcast.¹ BellSouth responds to those petitions, however, in only a fraction of its comments, near the end.² BellSouth refers to those petitions as requests for mere fine-tuning of the cellular eligibility rules and, instead, asks the Commission to "reconsider its decision to render cellular carriers (and their affiliates) ineligible to apply for more than a single 10 MHz license in-region."³

The statutory time for filing petitions for reconsideration had passed well before BellSouth filed its comments.⁴ The Commission is discouraged from accepting late-filed petitions for reconsideration and was upheld in its refusal to entertain a petition for reconsideration where the petition was filed one day late and extenuating circumstances did not prohibit the petitioner from filing within the prescribed time limit.⁵ Here, BellSouth was 15 days late and provided no excuse. The Commission should not let BellSouth avoid the statutory time limit by calling its petition for reconsideration something else.

The inappropriate nature of BellSouth's pleading is further shown by its length. Although there is no page limitation on petitions for reconsideration, BellSouth filed its pleading at the time that oppositions were due, and oppositions are to be limited to 25 double space pages.⁶ BellSouth's pleading, however, is 36 pages long (not counting the summary and signature page) plus an affidavit and a declaration.⁷ To our knowledge,

¹ BellSouth, p. 1.

² *Id.* at 29-38.

³ *Id.* at 2.

⁴ 47 U.S.C. § 405.

⁵ Virgin Islands Telephone Corp. v. F.C.C., 989 F.2d 1231, 1237 (D.C. Cir. 1993).

⁶ 47 C.F.R. § 1.429(f).

⁷ Although BellSouth responded to three petitions for reconsideration, it cannot be said that the 36 pages are distributed among three replies. Twenty-eight of the pages, plus the affidavit and

BellSouth did not request permission to exceed the page limit. The excessive length of this pleading, very little of which is devoted to responding to others, is further evidence that BellSouth's pleading is, in reality, a late-filed petition for reconsideration which should be rejected.

III. BELLSOUTH'S ARGUMENTS ARE SERIOUSLY FLAWED

BellSouth primarily relies on the affidavit of Richard P. Rozek for its arguments that the Commission should reconsider the cellular eligibility rules and eliminate or reduce the restrictions on cellular participation in PCS.⁸ In his affidavit attached hereto, Dr. Paul R. Milgrom refutes the main points of Dr. Rozek's affidavit.

First, Dr. Milgrom shows that Dr. Rozek's "estimate" of revenue losses by the government on account of restrictions on cellular companies is really an uninformed and vastly inflated guess.⁹ Dr. Rozek's "estimate" is based on some assumptions that are clearly impossible and others that are implausible, and is not a proper basis for rule making.¹⁰

Next, Dr. Milgrom uses Dr. Rozek's own figure on the level of market concentration in cellular mobile telephone services to show that the Commission's concerns about competition in the emerging wireless industry are well grounded.¹¹ Cellular companies with substantial holdings of PCS spectrum would be able to exclude competitors, manipulate prices, influence the emergence of PCS standards in order to delay

declaration, are devoted to BellSouth's own argument in support of a much broader reconsideration than is proposed by the other three parties. Only nine pages are devoted to responding to the others.

⁸ See BellSouth, pp. 8-30 and Exhibit I.

⁹ Affidavit of Paul R. Milgrom attached hereto, pp. 2-3.

¹⁰ Id.

¹¹ Id. at 3-4.

their implementation, and manipulate the standards to make PCS and cellular less directly competitive in the wireless market.¹²

Finally, Dr. Milgrom shows that Dr. Rozek's reliance on alternative safeguards that are already in place is flawed.¹³ Existing safeguards do not address many of the Commission's concerns.¹⁴ As Dr. Milgrom points out, the existing limits on cellular eligibility are needed in order to promote effective competition in wireless markets and bring the benefits of lower prices and better services to consumers.¹⁵

IV. THE FCC'S CURRENT LIMITS ON CELLULAR ELIGIBILITY ARE NEEDED IN ORDER TO CREATE A COMPETITIVE WIRELESS MARKET

BellSouth's recommendations to remove or reduce the limits on cellular eligibility would frustrate the Commission's goal to create a competitive wireless market. Part of the flaw in BellSouth's recommendation is that it is based on an analysis of market concentration and competition that fails to recognize the importance of ease of entry for establishing and retaining competition. This failure is contrary to both the FCC's market competition analysis and the DOJ/FTC antitrust analysis.

In its argument that unlimited cellular participation would not be anticompetitive, BellSouth depends on Dr. Rozek's analysis of market concentration and competition. Dr. Rozek argues that the market share of the dominant provider, not the number of competitors, is the key factor in measuring competition.¹⁶

¹² Id. at 4.

¹³ Id. at 4-5.

¹⁴ Id.

¹⁵ Id.

¹⁶ BellSouth, Exhibit I, Affidavit of Richard P. Rozek, pp. 5-6.

Actually, in telecommunications markets the key factor in measuring competition is not market share but ease of entry and elasticity of supply. In Docket 90-132, concerning competition in the interexchange market, the Commission recognized that "market share alone is not necessarily a reliable measure of competition, particularly in markets with high supply and demand elasticities."¹⁷ The Commission found that "the relative supply capabilities of competitors in the market" may be "more indicative of the level of competition" than are market share data.¹⁸ The Commission stated:

Relative supply capabilities allow an assessment of supply elasticity, which refers to the ability of competitors in a market to meet additional demand, beyond that which they currently meet. Supply elasticities are important because even if one company enjoys a very high market share, it will be constrained from raising its prices above cost if its competitors have, or could easily acquire, the capacity to serve its customers at current price levels.¹⁹

Consistent with the Commission's analysis, the courts have found that in markets with ease of entry that are experiencing substantial entry and output expansion, "market share is not a good measure of market power."²⁰ Thus, Dr. Rozek's extreme emphasis on market share of the dominant provider, as opposed to ease of entry, is inconsistent with the FCC's and the Courts' measurements of competition.

Dr. Rozek's extreme emphasis on market share of the dominant provider also is inconsistent with the DOJ/FTC antitrust analysis. Dr. Rozek acknowledges that the DOJ/FTC guidelines measure market concentration based on both the number of firms in a

¹⁷ Competition in the Interstate Interexchange Marketplace, CC Docket No. 90-132, Report and Order, 6 FCC Rcd 5880, 5890, para. 51 (1991).

¹⁸ Competition in the Interstate Interexchange Marketplace, CC Docket No. 90-132, Notice of Proposed Rulemaking, 5 FCC Rcd 2627, para. 51 (1990).

¹⁹ Id.

²⁰ See William M. Landes and Richard A. Posner, "Market Power In Antitrust Cases," Harv. L. Rev. 937, 950 (1981).

market and their respective market shares.²¹ Based on Dr. Rozek's concentration figure for cellular using the DOJ/FTC guidelines, the concentration level in the existing wireless market is extremely high.²² The DOJ/FTC guidelines recognize that potential entry can be a mitigating factor when concentration is high, but not when, "as a result of incumbent control, the tangible and intangible assets required for entry are not adequately available."²³ Here, licenses for PCS spectrum are required for entry into this wireless market. The spectrum is limited; the more spectrum that is controlled by incumbent cellular companies, the fewer new entrants there will be and the less spectrum those entrants will be able to acquire. Dr. Milgrom shows that, without the restrictions on cellular eligibility, the concentration level in the wireless market would remain far above the level designated as "highly concentrated" in the DOJ/FTC guidelines.²⁴ Thus, removal or reduction of the restrictions would be contrary not only to the FCC's recognition of the importance of ease of entry on the creation of competition but also to the DOJ/FTC antitrust analysis of appropriate concentration levels.

Removing or reducing the cellular eligibility restrictions also would be inconsistent with statements by Assistant Attorney General Anne K. Bingaman. According to the Antitrust Trade Regulation Report, she rejected arguments that mergers that fall outside normal antitrust standards generally should be permitted in high-tech industries. But she acknowledged that it may be acceptable to permit a merger that creates market power where it "is demonstrably necessary to sustain incentives for innovation or to bring

²¹ BellSouth, Exhibit I, Affidavit of Richard P. Rozek, p. 8.

²² See Affidavit of Paul R. Milgrom, p. 3, attached hereto.

²³ See Affidavit of Paul R. Milgrom, p. 4, attached hereto, quoting Horizontal Merger Guidelines, section 3.4.

²⁴ Affidavit of Paul R. Milgrom, p. 3, attached hereto.

the benefits of significant innovation to market more quickly."²⁵ By analogy, removing restrictions on cellular eligibility would result in concentration levels outside normal antitrust standards (e.g., the DOJ/FTC Guidelines), but BellSouth has certainly not demonstrated that high concentration levels are needed for innovation in the wireless market. In fact, innovation in this market would be harmed by the high market concentration that would result from unlimited cellular participation.²⁶

If a cellular firm tried to merge with or acquire a PCS firm in the cellular firm's territory after the auction, DOJ would certainly challenge the attempt as being outside normal antitrust standards (e.g., the DOJ/FTC Guidelines) and as not meeting the test for an exception that was outlined by Anne Bingaman. The Commission should not allow cellular firms to get around this DOJ merger analysis via the broadband PCS spectrum auction.

In order to create a competitive wireless market, the Commission should retain a structure that stands up under the DOJ/FTC antitrust analysis and that is consistent with its own belief in the importance of ease of entry in telecommunications markets. Accordingly, the Commission should retain its restrictions on cellular eligibility.

²⁵ Antitrust & Trade Regulation Report, News & Comment, Volume 66, January 13, 1994, concerning Assistant Attorney General Anne K. Bingaman's statements on January 10, 1994, at a symposium.

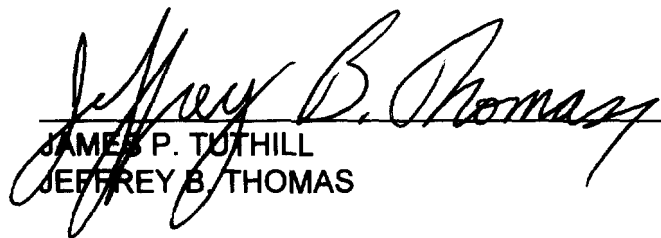
²⁶ See Affidavit of Paul R. Milgrom, p. 4, attached hereto.

V. CONCLUSION

For all the above reasons, the Commission should reject BellSouth's comments.

Respectfully submitted,

PACIFIC BELL MOBILE SERVICES



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Its Attorneys

Date: September 14, 1994

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554**

Affidavit of Paul R. Milgrom

1. My name is Paul R. Milgrom. I am the Shirley and Leonard Ely, Jr. Professor of Humanities and Sciences and Professor of Economics at Stanford University in Stanford, California, 94305.

2. I received an A.B. degree in Mathematics from the University of Michigan and an M.S. in Statistics and a Ph.D. in Business from Stanford University. My academic specialty is microeconomic theory, with an emphasis on how institutions affect economic performance. From 1990-1994, I was coeditor of the largest circulation academic journal in the economics profession—the *American Economic Review*. I have also served on the editorial boards of several other economics journals. I am the author of more than sixty books and articles and have been the recipient of numerous awards and honors, including Fellowships in the American Academy of Arts and Sciences and the Econometric Society. I have also received Fellowship grants from the John Simon Guggenheim Foundation, the Center for Advanced Study in the Behavioral Sciences, and the Center for Advanced Studies in Jerusalem. My curriculum vitae is attached.

3. I have devoted considerable time and attention to telecommunications issues, especially ones concerning broadband PCS. In the past twelve months, I have filed six affidavits or statements with the Commission regarding these matters, including two that were coauthored with my colleague, Stanford Professor Robert Wilson. Earlier this year, I filed an affidavit in the connection with the motion to terminate the MFJ. When the MFJ was initially imposed, I advised the Southern New England Telephone Company in contract renegotiations with AT&T that the MFJ had necessitated.

4. My other experience with regulatory matters is diverse. It includes testimony given to the Federal Energy Regulatory Commission concerning pricing on the Trans-Alaska pipeline, testimony at trial concerning the economics of the insurance contracting, and written testimony concerning environmental regulation filed with the National Oceanographic and Atmospheric Administration (NOAA).

5. I have been asked by Pacific Bell Mobile Services to review and comment on the affidavit filed by Dr. Richard Rozek that was attached to the August 30 petition by BellSouth in GEN Docket 90-314. In his affidavit, Dr. Rozek argues in favor of allowing cellular providers to participate without restriction in the upcoming broadband PCS auction.

6. My comments will refute the main points of Dr. Rozek's affidavit. Specifically, I argue (1) that, due to faulty assumptions in Dr. Rozek's analysis, the revenue losses by the government on account of restrictions on cellular companies is likely to be far smaller than he estimated, (2) that the Commission's concerns about competition in the emerging wireless industry are well grounded in economic analysis such as that found in the 1992 Merger Guidelines issued by the Federal Trade Commission and the Department of Justice, and (3) that, contrary to Dr. Rozek's claims, the other safeguards in the FCC rules are insufficient to ensure effective competition in the eventual wireless marketplace.

Losses of Auction Revenue from Cellular Restrictions

7. Dr. Rozek's first point is that the exclusion of cellular companies from full participation in the broadband auctions will reduce revenues from the auction, claiming that, under certain assumptions, "an estimate of the loss is \$5.6 billion."

8. Certainly, any restriction on participation by bidders will naturally lead to some reduction in expected auction revenues, but Dr. Rozek's estimate is ridiculously high. It is based on the assumption that, for every broadband license, the cellular exclusion rule would, by itself, prevent any cellular company from being the highest bidder. This crucial assumption is dramatically false. The cellular restriction does not, by itself, prevent cellular entities from winning the 1/3 of spectrum in the entrepreneurs' block, because these entities would remain ineligible for that spectrum even if the restrictions on cellular participation were eliminated. The restriction does not prevent cellular companies from acquiring blocks D and E if they hold the highest values for those; all cellular companies are eligible under existing rules to bid for those licenses. The restriction does not itself prevent cellular companies from bidding to acquire the three A-band licenses already awarded to pioneers; these will be unavailable in the auction regardless of the cellular participation rules. Correcting these obvious errors alone would reduce Dr. Rozek's estimate by roughly 2/3 to about \$1.9 billion.

9. Even the resulting reduced estimate, however, is still much too high. For Dr. Rozek has also assumed that, but for the cellular restrictions, cellular companies would acquire every one of the 99 A and B licenses in their existing markets at the auction, and no cellular company would win a license in any area where it does not currently operate. There is neither evidence nor logic offered to support such a drastic forecast.

10. Dr. Rozek's \$5.6 billion estimate is constructed from some assumptions that are clearly impossible and others that are implausible. Such an estimate can hardly be a proper basis for any kind of public decision.

Competitive Concerns

11. Dr. Rozek dismisses the Commission's concern about the high levels of concentration in wireless communications, while reporting by his own calculations that the weighted average HHI (Herfindahl-Hirschman Index) for cellular mobile telephone services is 5253. To put this very high index value in perspective, according to the 1992 *Horizontal Merger Guidelines* issued jointly by the Department of Justice and the Federal Trade Commission, industries can be broadly characterized as unconcentrated if the HHI is below 1000, moderately concentrated if the HHI is between 1000 and 1800, and highly concentrated if the HHI is above 1800.¹ The current HHI index value of 5253 is far above the standard set forth in the *Guidelines* for a highly concentrated industry. Moreover, it is likely that the wireless communications markets will continue to be highly concentrated in the foreseeable future, even after the introduction of PCS services. Indeed, with five or fewer firms in a market — which is the probable condition of most wireless markets during the next decade even with the restrictions on cellular participation, it is logically impossible for the HHI to be less than 2000, regardless of the market shares of the five firms. Removing the restrictions on participation in personal communication services (PCS) by cellular companies in their existing markets can only make this problem worse.

12. The competitive consequences of this high level of concentration are described in the *Horizontal Merger Guidelines*. High concentration makes it more likely that firms will "engage in coordinated action that harms consumers."²

¹*Horizontal Merger Guidelines*, section 1.5.

²*Horizontal Merger Guidelines*, section 2.2

13. The *Guidelines* recognize the possible importance of potential entry as a mitigating factor when concentration is high, but not when, "as a result of incumbent control, the tangible and intangible assets required for entry are not adequately available."³ In this case, the incumbent's ownership of spectrum rights is precisely the sort of control that effectively blocks entry.

14. Besides the general disadvantages of excessive concentration described in the *Guidelines*, there are additional reasons why participation by cellular companies in PCS would be harmful. Cellular companies with substantial holdings of PCS spectrum would be well positioned to influence the emergence of PCS standards and to delay their implementation. With cellular companies rapidly expanding and upgrading their cellular products, they would benefit from a slower development of PCS standards, which would allow them to gain a deeper penetration and firmer hold on their markets before PCS becomes a strong competitor. These cellular firms would also benefit by advocating standards that differentiate PCS and cellular services more than market conditions warrant in order to make the two kinds of services less directly competitive. In general, allowing cellular companies to acquire substantial PCS spectrum in their existing territories would provide them with too much control over their competition, to the public detriment.

Alternative Safeguards

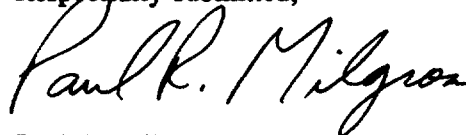
15. Dr. Rozek claims that various rules already in place will ensure the good behavior of cellular companies after the auction, but his arguments are unconvincing. He argues that the Commission's build-out rules would prevent cellular companies from stockpiling spectrum. The build-out rules are helpful in that regard, but there are other problems they do not address. If cellular companies controlled too much PCS spectrum, they might be able to delay agreements on standards, advocate standards that make PCS less directly competitive with cellular services, or build out their networks at the minimum allowed pace even in service areas where faster build-out is warranted. There are no safeguards against these forms of harmful behavior.

16. Experience in other industries indicates that direct regulation is a poor substitute for effective competition, and there is no reason to suppose that the wireless industry will be an exception. To promote effective competition in wireless markets, the Commission should retain its rules prohibiting cellular

³*Horizontal Merger Guideline*, section 3.4

companies from acquiring more than 10 MHz of additional spectrum in their current service areas. The increased competition is most likely to result in a quicker build-out of PCS networks, lower prices and better quality services for wireless customers.

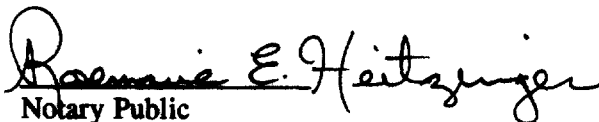
Respectfully submitted,



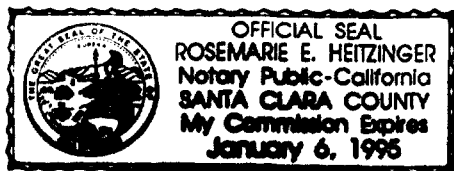
Paul R. Milgrom

Date:

Subscribed and sworn to before me this 13th day of September, 1994.


Notary Public

My Commission expires Jan. 6, 1995.



- | | |
|---------|--|
| 1987- | Stanford University
Shirley R. and Leonard W. Ely, Jr. Professor of Humanities and Sciences (1993-)
Professor of Economics (1987-)
Director, Stanford Institute for Theoretical Economics (1989-91) |
| 1986-87 | University of California - Berkeley
Ford Visiting Professor of Economics |
| 1982-87 | Yale University
Williams Brothers Professor of Management Studies and Professor of Economics
1985-87
Professor of Economics and Management 1983-85
Visiting Professor 1982-83 |
| 1979-83 | Northwestern University
Kellogg Graduate School of Management
Department of Managerial Economics and Decision Sciences
Professor 1982-83
Associate Professor 1981-82
Assistant Professor 1979-81 |
| 1981 | Stanford University
Visiting Research Associate in Economics |

- 1972-75 **Nelson and Warren, Inc.**
Consulting Actuary
- 1970-71 **Metropolitan Life Insurance Co.**
Actuarial Trainee

Education

- 1975-78 **Stanford University**
Ph.D. in Business, January 1979
M.S. in Statistics, April 1978
- 1966-70 **University of Michigan**
A.B. in Mathematics with high honors, May 1970

Honors, Awards, Prizes, Fellowships, Chairs and Grants

- 1994 National Science Foundation research grant "Comparative Statics, Complementarities, Coordination and Change," covering 1994-1997. Woytinsky distinguished lecturer, University of Michigan.
- 1993 Senior Research Fellow, Institute for Policy Reform. Shirley R. and Leonard W. Ely, Jr. Professor of Humanities and Sciences.
- 1992 Fellow, American Academy of Arts and Sciences. International Guest Scholar, Kyoto University.
- 1991 Fellow, Center for Advanced Study in the Behavioral Sciences. National Science Foundation research grant "Theories of the Firm - 2" covering 1991-1994.
- 1990 Center for Economic Policy Research grant to study "The Economics of Modern Manufacturing."
- 1989 National Science Foundation grant to direct programs for the Stanford Institute for Theoretical Economics; National Academy of Sciences award to lecture in China on economics of organizations.
- 1988 Olin Distinguished Lecturer, Princeton University; National Science Foundation research grant "Theories of the Firm" covering 1988-91; Center for Economic Policy Research grant.

- 1987 Prize for Best Paper of the Year in the *Transactions of the Society of Actuaries*.
- 1986 Ford Visiting Professor of Economics, University of California-Berkeley; John Simon Guggenheim Fellowship to study "Economic Theories of Organization."
- 1985 Williams Brothers Chair in Management Studies, Yale University; National Science Foundation research grant "On the Formal Economic Theory of Organizations"; Fellow of the Institute for Advanced Studies, Hebrew University of Jerusalem; plenary lecturer at the Fifth World Congress of the Econometric Society.
- 1984 Fellow of the Econometric Society; Fellow of Morse College (of Yale University)
- 1983 Research Award, Actuarial Education and Research Fund; Honorary Master of Arts degree, Yale University
- 1982 National Science Foundation research grant to study "The Structure of Information in a Productive Organization."
- 1981 IBM Research Chair at Northwestern University
- 1980 Leonard J. Savage Memorial Thesis Award; National Science Foundation research grant: "Information and Uncertainty in Competitive Bidding."
- 1976 Society of Actuaries Triennial Paper Prize for best paper by an actuary within five of membership, for the period 1973-75.
- 1974 Fellow of the Society of Actuaries

Major Professional Activities and Affiliations

- 1994- Program Committee, 1995 World Congress of the Econometric Society
- 1993- Senior Research Fellow, Institute for Policy Reform
- 1993- Editorial Board, *Journal of Economics and Management Strategy*
- 1993- Associate Editor, *American Economic Review*
- 1992- Fellow, American Academy of Arts and Sciences
- 1990-93 Co-Editor, *American Economic Review*
- 1990- Associate Editor, *Games and Economic Behavior*
- 1989-92 Associate Editor, *Journal of Financial Intermediation*
- 1987-90 Associate Editor, *Econometrica*
- 1985-89 Associate Editor, *Rand Journal of Economics*
- 1983-87 Associate Editor, *Journal of Economic Theory*
- 1984 Chair, Program Committee, Econometric Society Winter Meetings
- 1984- Fellow, Econometric Society
- 1980- Member, American Economic Association
- 1979- Numerous lectures and visiting scholar positions at universities, research institutes and policy centers in Argentina, Belgium, Canada, China, England, France, Germany, Israel, Italy, Japan, Spain, Sweden, Switzerland, the United States, Uruguay and Venezuela.

Selected Economic Consulting Experience

- SRI, Inc. (Rexnord's expansion into Brazilian rock crusher market)
- Southern New England Telephone Co. (Financial valuation of perpetual service contract)
- Rand Corp (Evaluation of U.S. defense procurement practices)
- Arctic Slope Regional Corporation (FERC Hearings on Trans-Alaska Pipeline tariffs. Gave written testimony on economics of cost allocation and pricing.)
- Georgia Pacific (Great Northern Nekoosa merger/antitrust litigation)
- Exxon (Environmental damage assessment, Exxon Valdez oil spill)
- Bishop, Barry et. al. (Asbestos-related insurance litigation: Flintkote v Commercial Union. Testified as expert on economics of risk bearing)
- Pacific Bell Telephone (Auction design, bidding, and PCS regulatory matters)

Publications

Books

The Structure of Information in Competitive Bidding (Ph.D. Dissertation), New York: Garland Press, 1979.

Economics, Organization and Management (with John Roberts), Englewood Cliffs: Prentice-Hall, 1992.

Instructor's Manual for Economics, Organization and Management (with John Roberts, assisted by Nicolaj Siggelkow), Englewood Cliffs: Prentice-Hall, 1992.

Articles by Topic

Actuarial Science

1. On Understanding the Effects of GAAP Reserve Assumptions, *Transactions of the Society of Actuaries*, 27, 1975, 71-88.
2. Measuring the Interest-Rate Risk, *Transactions of the Society of Actuaries*, XXXVII, 1985: 241-57.
3. Reply to the Comments on "Measuring the Interest Rate Risk," *The Transactions of the Society of Actuaries*, XXXVII, 1985: 297-302.

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1. A Convergence Theorem for Competitive Bidding with Differential Information, *Econometrica*, 47, 1979, 679-88.
2. Rational Expectations, Information Acquisition, and Competitive Bidding, *Econometrica*, 49, 1981, 921-43.
3. The Value of Information in a Sealed Bid Auction (with Robert Weber), *Journal of Mathematical Economics*, 10, 1982, 105-14.
4. A Theory of Auctions and Competitive Bidding (with Robert Weber), *Econometrica*, 50, 1982, 1089-1122. (Reprinted in (1) *Game Theory in Economics*, edited by Ariel Rubinstein, London: Edward Elgar Publishing, 1990 and in (2) *The Economics of Information*, edited by Steven A. Lippman and John E. Anderson, London: Edward Elgar Publishing, 1994.)
5. Competitive Bidding with Proprietary Information (with Richard Engelbrecht-Wiggans and Robert Weber), *Journal of Mathematical Economics*, 11, 1983, 161-69.

6. **The Economics of Competitive Bidding: A Selective Survey**, *Social Goals and Social Organization: A Volume in Honor of Elisha Pazner*, edited by L. Hurwicz, D. Schmeidler and H. Sonnenschein, London: Cambridge University Press, 1985, Chapter 9, 261-89.
7. **Auction Theory**, *Advances in Economic Theory: Fifth World Congress*, edited by Truman Bewley, London: Cambridge University Press, 1987, 1-32.
8. **Auctions and Bidding: A Primer**, *Journal of Economic Perspectives*, 3, Summer 1989, 3-22.

Pricing Strategies

1. **Limit Pricing and Entry Under Incomplete Information: An Equilibrium Analysis** (with John Roberts), *Econometrica*, 50, 1982, 443-59. (Reprinted in (1) *Industrial Organization*, edited by Oliver Williamson, London: Edward Elgar Publishing, 1990, and in (2) *The Economics of Information*, edited by Steven A. Lippman and John E. Anderson, London: Edward Elgar Publishing, 1994.)
2. **Predation, Reputation, and Entry Deterrence** (with John Roberts), *Journal of Economic Theory*, 27, 1982, 280-312.
3. **Price and Advertising Signals of Product Quality** (with John Roberts), *Journal of Political Economy*, 94, 1986, 796-821.
4. **Predatory Pricing**, *The New Palgrave: A Dictionary of Economic Theory and Doctrine*, J. Eatwell, M. Milgate, and P. Newman (eds.), London: MacMillan Press Ltd., 1988.
5. **Informational Asymmetries, Strategic Behavior and Industrial Organization** (with John Roberts), *AEA Papers and Proceedings*, 77, May 1987, 184-93.
6. **An Essay on Price Discrimination**, in *The Economics of Imperfect Competition and Employment: Joan Robinson and Beyond*, edited by George Feiwel, New York: MacMillan and New York: New York University Press, 1989, 365-86.
7. **New Theories of Predatory Pricing** (with John Roberts), *Industrial Structure in the New Industrial Economics*, Giacomo Bonanno and Dario Brandolini (eds), Oxford: Oxford University Press, 1990: 112-37.

Incentives and Organization

1. **Aggregation and Linearity in the Provision of Intertemporal Incentives** (with Bengt Holmstrom), *Econometrica*, 55(2) March 1987, 303-28.
2. **Relying on the Information of Interested Parties** (with John Roberts), *Rand Journal of Economics*, 17, 1986, 18-32.
3. **Job Discrimination, Market Forces, and the Invisibility Hypothesis** (with Sharon Oster), *Quarterly Journal of Economics*, 102, August 1987, 453-476.
4. **Employment Contracts, Influence Activities and Efficient Organization Design**, *Journal of Political Economy*, 96(1), February 1988, 42-60.
5. **An Economic Approach to Influence Activities and Organizational Responses** (with John Roberts), *American Journal of Sociology*, 94 (Supplement), July 1988, S154-S179.
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